

CRUISE RESULTS

CHARTERED VESSELS R/V ALASKA (CRUISE NO. 95-1) AND F/V VESTERAALLEN (CRUISE NO. 95-1) 1995 WEST COAST TRIENNIAL GROUND FISH ASSESSMENT SURVEY JUNE 1 - SEPTEMBER 25, 1995

The seventh triennial comprehensive bottom trawl survey of west coast continental shelf groundfish resources was recently completed by the Resource and Assessment Conservation Engineering (RACE) Division of the Alaska Fisheries Science Center (AFSC). This report summarizes the preliminary results of the survey.

ITINERARY

The survey was conducted aboard the chartered commercial trawler *Vesteraalen* from June 1 through August 2, and the research vessel *Alaska* from June 19 through September 25 (Table 1). The vessels worked northward from Pt. Conception, California, to central Vancouver Island (Nootka Sound), British Columbia, Canada (lat. 34°30' to 49°30' N), sampling predetermined stations between 55 and 500 meters in depth (Fig. 1).

OBJECTIVES

The triennial groundfish surveys are designed to describe and monitor the distribution, abundance, and population biology parameters of various groundfish stocks off the U.S. Pacific coast. Previous surveys in this series were conducted in 1977, 1980, 1983, 1986, 1989, and 1992. The objectives of the 1995 survey were similar to those in 1992, specifically they were:

1. to describe and assess the demersal component of the Pacific hake (*Merluccius productus*) resource;
2. to describe and assess the shallow component of the sablefish (*Anoplopoma fimbria*) resource, specifically those 1.5 years old;
3. to monitor the abundance, distribution, and biological

characteristics of principal rockfish (*Sebastes* spp.) species, including those inhabiting the upper slope;

4. to monitor the status of other important groundfish stocks;

5. to determine the biological population characteristics of key groundfish species (e.g. size composition, age composition, size at maturity, length-weight relationships, and feeding habits);

6. to collect samples from several species for biological studies to be conducted by scientists at various fishery agencies and academic institutions; and

7. to collect sea temperature profiles.

VESSELS AND GEAR

We conducted the survey aboard two chartered vessels. The F/V *Vesteraalen* is a 37.8 m commercial trawler powered by a single main engine with 1,710 continuous horsepower. The research trawler R/V *Alaska*, operated by the University of Washington, is 30.5 m long and powered by a single main engine with 855 continuous horsepower. Each vessel was staffed by an experienced skipper and crew in addition to six scientists.

Both vessels used standardized polyethylene Nor'eastern high opening bottom trawls equipped with bobbin roller gear. Gear specifications include: a 27.2 m headrope with twenty-one 30 cm floats, and a 24.3 m long link chain fishing line attached to a 24.9 m footrope. The roller gear was 24.2 m long, constructed of 2 cm diameter galvanized wire rope, 36 cm rubber bobbins spaced 1.5 m apart and separated by a solid string of 10 cm rubber disks. At each end of the roller gear, a 5.9 m wire rope extension with 10 cm and 20 cm rubber disks spanned the lower flying wing section. Trawls were made of 12.7 cm stretched-mesh polyethylene web with a 0.6 cm mesh nylon liner in the codend. Nets were rigged with triple 54.9 m, 1.6 cm diameter galvanized wire rope dandylines. Steel V-doors (2.1 x 1.5 m) weighing approximately 567 kg each were used. For most of the tows, the fishing dimensions of the trawl were measured using a Scanmar¹ net measurement system. Preliminary inspection of the data revealed that the trawl nets fished by the

¹Reference to trade names or commercial firms does not constitute U.S. government endorsement.

Vesteraalen had a 13.9 m mean path width while those fished aboard the *Alaska* had a 12.6 m mean path width.

Sea surface temperatures and temperature-depth profiles were obtained from most hauls with a net mounted data logger. At some sites when the data logger was not used, surface temperatures were obtained by bucket thermometer.

SURVEY DESIGN AND METHODS

The triennial west coast bottom trawl survey was designed primarily as a method for assessing the abundance and distribution of a broad range of economically important groundfish species. We have modified the design of the survey periodically to collect more detailed information on specific species groups, while maintaining the primary multispecies objectives. In 1995 we implemented a modification that shifted sampling effort out of some shallow areas in order to extend the survey deeper than in previous years (367-500 m). Extra shallow stations, added in 1989 to improve the precision of sablefish abundance estimates, were dropped so that deeper stations could be added to fulfill the current need of resource managers for more complete data on slope dwelling rockfish species such as darkblotched (*Sebastes crameri*), splitnose (*S. diploproa*), sharpchin (*S. zacentrus*), and redstriped rockfish (*S. proriger*).

The survey area extended from Point Conception (34°30'N) to SW Vancouver Island (49°30'N). The area was stratified by depth (55-183, 184-366, and 367-500 m) based on general distribution patterns of the major target species. Beginning at latitude 34°34.5' N., 119 tracklines were drawn across the three depth strata spaced every 10 minutes of latitude. Stations, 609 in all, were randomly located along these tracklines at the rate of one station per linear 7.4 km in the shallow stratum, and one station per linear 9.3 km in the middle and deep strata. At least one trawl station was assigned to each depth stratum along each trackline. The two vessels, when working simultaneously, fished alternate tracklines.

Fishing operations for both vessels were standardized (i.e., by having the vessel captains attempt to maintain a constant fishing depth and to set the gear so that, upon first bottom contact, the trawl was close to, if not in, full fishing configuration). Tows were 30 minutes in duration between the time the net achieved a stable, on-bottom fishing configuration and the time retrieval began. Catches were sorted, weighed and counted by species, and a variety of biological data (age, length, weight, and maturity of individual specimens) were collected. Samples were also collected from several

species for more detailed studies of their biology.

RESULTS

Successful trawl hauls were achieved at 524 of the 533 stations sampled (Fig. 1). There were 76 stations abandoned due to untrawlable bottom (Table 2). Surface to bottom temperature profiles were collected by a XL200 micro bathythermograph datalogger at 514 stations. Figure 2 presents sea surface and bottom temperatures by latitude. Surface temperatures were taken at an additional 15 stations using a bucket thermometer.

We identified 155 fish species, representing 56 families, in catches throughout the survey. Catches also contained numerous orders of invertebrates. The types and counts of biological data collected as part of the RACE mission are summarized in Table 3. Age structures from a number of species were collected to be read by the following organizations: NMFS Alaska Fisheries Science Center (Pacific hake, Pacific ocean perch (*S. Alutus*), and sablefish); NMFS Northwest Fisheries Science Center (several rockfish species); NMFS Southwest Fisheries Science Center (bocaccio (*S. paucispinis*)); NMFS Pacific Fisheries Environmental Group (canary (*S. pinniger*), and splitnose rockfish); International Pacific Halibut Commission (Pacific halibut (*Hippoglossus stenolepis*)); and Washington Department of Fish and Wildlife (lingcod (*Ophiodon elongatus*)).

Table 4 lists the dominant fish species caught by International North Pacific Fishery Commission (INPFC) area and depth stratum, ranked in order of catch per unit effort (CPUE) expressed as kilograms/hectare (kg/ha) trawled. Figure 1 shows the INPFC area boundaries. Pacific hake was the dominant component of the catch in all INPFC areas except the Conception and Canadian portion of the Vancouver area. Splitnose rockfish and arrowtooth flounder (*Atheresthes stomias*), respectively, were predominant in these two areas. Other dominant catch components were Dover sole (*Microstomus pacificus*) and stripetail rockfish (*S. saxicola*) to the south and Dover sole, sablefish, Pacific sanddab (*Citharichthys sordidus*), and spiny dogfish (*Squalus acanthias*) to the north.

Dominant species in the catches varied by depth stratum. Catches in the shallow depth stratum were dominated by Pacific hake in each area except the Conception and Canadian portion of the Vancouver INPFC areas. Spotted ratfish (*Hydrolagus colliei*) and arrowtooth flounder, respectively, were predominant in these two areas. Catches in the middle depth stratum were dominated by splitnose rockfish in the Conception area, Pacific

hake in the Monterey and Eureka areas, sablefish in the Columbia area, Dover sole in the U.S. portion of the Vancouver area, and Pacific ocean perch in the Canadian portion of the Vancouver area. The dominant catch components of the survey's deepest stratum were Dover sole in the Conception, Monterey, and U.S. portion of the Vancouver areas, sablefish in the Eureka and Columbia areas, and roughey rockfish (*S. aleutianus*) in the Canadian portion of the Vancouver area.

Figure 3 shows the unweighted size compositions for several commercially important groundfish species. These distributions suggest that recent year classes of several species, including Pacific hake, sablefish, Pacific ocean perch, chilipepper (*S. goodei*), darkblotched rockfish and arrowtooth flounder may be stronger than average.

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Table 1.--Vessel itineraries and scientists participating during the 1995 triennial bottom trawl survey.

VESTERAALEN (63 DAYS)

Leg 1: 6/5 - 6/23 San Francisco, CA - San Francisco, CA		Leg 2: 6/23 - 7/12 San Francisco, CA - Eureka, CA	
Ken Weinberg, AFSC	Chief Scientist	Mark Zimmerman, AFSC	
Mark Zimmerman, AFSC	Fishery Biologist	Mike McEwan, AFSC	
	Gear Specialist		
Robin Harrison, AFSC	Fishery Biologist	Angie Grieg, AFSC	
	Computer Technician		
Ron Payne, AFSC	Biological Technician	Nancy Roberson, AFSC	
	Biological Technician		
Dave Somerton, AFSC	Fishery Biologist	Brian Jarvis, SWFSC	
	Fishery Biologist		
Sand Borrego, AFSC	Gear Specialist	Bill Phoel, OERI	
	Fishery Biologist		
Leg 3: 7/12 - 8/1 Eureka, CA - Astoria, OR			
Mike Martin, AFSC	Chief Scientist		
Bill Flerx, AFSC	Fishery Biologist		
Alonzo Hamilton, SEFC	Fishery Biologist		
Lisa Britt, AFSC	Oceanographer		
Delsa Anderl, AFSC	Fishery Biologist		
Bill Rugen, AFSC	Fishery Biologist		

ALASKA (97 DAYS)

Leg 1: 6/23 - 7/12 San Francisco, CA - Eureka, CA		Leg 2: 7/12 - 7/31 Seattle, WA - Astoria, OR	
Frank Shaw, AFSC	Chief Scientist	Ken Weinberg, AFSC	
Chief Scientist			
Bill Flerx, AFSC	Fishery Biologist	Mike McEwan, AFSC	Gear
Specialist			
Axa Rocha-Olivares, SIO	Fishery Biologist	Jay Clark, AFSC	
Fishery Biologist			
Mike O'Farrell, PFEG	Fishery Biologist	Ingrid Spies, AFSC	
Biological Technician			
Jitka Klier, UCSB	Student	Edward Lamon, MLML	
Fishery Biologist			
Lynn Faughnan	Fishery Biologist	Lynn Faughnan	
Fishery Biologist			
Leg 3: 7/31 - 8/18 *** Astoria, OR - Seattle, WA		Leg 4: 8/21 - 9/11 Seattle, WA - Seattle, WA	
Bob Lauth, AFSC	Chief Scientist	Bob Lauth, AFSC	Chief
Scientist			
Jay Orr, AFSC	Fishery Biologist	Steve Syrjala, AFSC	
Statistician			
Robin Harrison, AFSC	Fishery Biologist	Jim Stark, AFSC	
Fishery Biologist			
Linda Browne, MLML	Assoc. Prof. Biol.	Jean Rogers, NWFSC	
Fishery Biologist			
Eileen Grogan, SJ	Fishery Biologist	Tonya Builder, NWFSC	
Fishery Biologist			
Geoff Thomas, HC	Student	Mark Freeman,	
ODF&W	Fishery Biologist		
Leg 5: 9/11 - 9/25 Seattle, WA - Seattle, WA			

Ken Weinberg, AFSC	Chief Scientist	AFSC - NMFS Alaska Fisheries
Science Center, Seattle, WA		
Scott McEntire, AFSC	Fishery Biologist	SWFSC - NMFS Southwest
Fisheries Science Center, Tiburon, CA		
Mike McEwan, AFSC	Gear Specialist	NWFSC - NMFS Northwest
Fisheries Science Center, Newport, OR		
Russ Nelson, AFSC	Fishery Biologist	SEFSC - NMFS Southeast
Fisheries Science Center, Pascagoula, MS		
Bill Flerx, AFSC	Fishery Biologist	OERI - NMFS Office of Environ.
Res. Info., Silver Springs, MD		
Dave Somerton, AFSC	Fishery Biologist	PFEG - NMFS Pacific Fish. Environ.
Group, Pacific Grove, CA		
Ron Payne, AFSC	Biological Technician	MLML - Moss Landing
Marine Lab, Moss Landing, CA		
Wildlife, Newport, OR		ODF&W - Oregon Department of Fish and
Jolla, CA		SIO - Scripps Institute of Oceanography, La
		SJ - Saint Joseph's University, Philadelphia, PA
		HC - Hayward College, Hayward, CA
		UCSC - University of California Santa Cruz,
Santa Cruz, CA		
*** Cruise Break 8/19 - 8/20		

Table 2.--Summary of sampling success at bottom trawl stations in each International North Pacific Fisheries Commission (INPFC) area and depth stratum during the 1995 NMFS triennial bottom trawl survey.

INPFC Area		Shallow (55-183m)	Middle (184-366m)	Deep (367-500m)	Total (55-500m)
Conception					
	Successful	16	12	18	46
	Unsuccessful	0	0	1	1
	Abandoned	0	0	0	0
Monterey					
	Successful	76	22	20	118
	Unsuccessful	1	0	1	2
	Abandoned	5	9	7	21
Eureka					
	Successful	37	16	13	66
	Unsuccessful	1	0	0	1
	Abandoned	0	1	3	4
Columbia					
	Successful	115	39	29	183
	Unsuccessful	1	0	0	1
	Abandoned	8	7	7	22
U.S. Vancouver					
	Successful	23	13	4	40
	Unsuccessful	2	1	0	3
	Abandoned	7	1	2	10
Canadian Vancouver					
	Successful	55	9	7	71
	Unsuccessful	1	0	0	1
	Abandoned	10	4	5	19

Table 3.--Biological data collected during the 1995 west coast triennial bottom trawl survey. Abbreviations: length frequency (LF), age structure¹ (AGE), individual specimen weight (WGT), and maturity (MAT).

SPECIES	LF	AGE	WG	MA	SPECIES	LF	AGE	WG	MA
ARROWTOOTH FLOUNDER	529				PACIFIC OCEAN PERCH	263	685	685	685
AURORA ROCKFISH	236	122	122	122	PACIFIC SANDDAB	200	581	581	422
BANK ROCKFISH	180				PACIFIC TOMCOD	297			
BLACKGILL ROCKFISH	188	22	22	22	PETRALE SOLE	164			
BLUE ROCKFISH	23				PLAINFIN MIDSHIPMAN	169	300	300	300
BOCACCIO	178	256	254	244	PYGMY ROCKFISH	401			
BROWN ROCKFISH	1				QUILLBACK ROCKFISH	12			
BUTTER SOLE	1				REDBANDED ROCKFISH	382			
CALIFORNIA HALIBUT	4				REDSTRIPE ROCKFISH	129	188	188	187
CANARY ROCKFISH	638	361	361	359	REX SOLE	303			
CHILIPEPPER	405	522	522	522	ROCK SOLE	550			
CHINOOK SALMON	106				ROSETHORN ROCKFISH	142	112	112	112
CHUB MACKEREL	429				ROUGHEYE ROCKFISH	110			
COPPER ROCKFISH	4				SABLEFISH	844	166	166	163
COWCOD	25	2	2	2	SAND SOLE	64			
CURLFIN SOLE	38				SHARPCHIN ROCKFISH	312	386	386	386
DARKBLOTCHED ROCKFISH	295	713	713	713	SHORTEBELLY ROCKFISH	348			
DOVER SOLE	240				SHORTRAKER ROCKFISH	19			
ENGLISH SOLE	113				SHORTSPINE THORNYHEAD	117			
FLAG ROCKFISH	3				SILVERGRAY ROCKFISH	98	86	86	86
FLATHEAD SOLE	176				SLENDER SOLE	232	120	120	120
GREENBLOTCHED	1				SPINY DOGFISH	93			
GREENSPOTTED ROCKFISH	148				SPLITNOSE ROCKFISH	100	103	103	103
GREENSTRIPED ROCKFISH	616	448	448	448	SQUARESPOT ROCKFISH	34			
HALFBANDED ROCKFISH	511	34	34	34	STRIPETAIL ROCKFISH	917			
HORNYHEAD TURBOT	41				VERMILION ROCKFISH	10			
JACK MACKEREL	184				WALLEYE POLLOCK	90			
LINGCOD	880	927	914	594	WHITE CROAKER	892	318	318	318
LIZARDFISH UNIDENT.	5				WIDOW ROCKFISH	501			
LONGSPINE THORNYHEAD	208				YELLOW EYE ROCKFISH	16	22	22	22
PACIFIC COD	330				YELLOWMOUTH ROCKFISH	36	17	17	17
PACIFIC HAKE	569	713	713	713	YELLOWTAIL ROCKFISH	113	512	512	512
PACIFIC HALIBUT	461	150	150	136					

¹Finrays were collected for lingcod. Otoliths were collected for all other species.

Table 4.--Mean CPUE (kg/ha) for the 15 most abundant groundfish species by International North Pacific Fisheries Commission (INPFC) area and depth stratum during the 1992 triennial groundfish survey.

CONCEPTION AREA 55 - 183 m		CONCEPTION AREA 184 - 366 m		CONCEPTION AREA 367 - 500 m		CONCEPTION AREA 55 - 500 m	
SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE
SPOTTED RATFISH	22.0	SPLITNOSE ROCKFISH	62.8	DOVER SOLE	27.4	SPLITNOSE ROCKFISH	18.0
PACIFIC SANDDAB	13.0	STRIPETAIL ROCKFISH	38.2	PACIFIC HAKE	13.3	PACIFIC HAKE	15.1
SPINY DOGFISH	11.4	PACIFIC HAKE	37.3	REX SOLE	6.4	DOVER SOLE	12.8
PACIFIC SARDINE	10.6	CHILIPEPPER	13.7	AURORA ROCKFISH	4.6	STRIPETAIL ROCKFISH	10.1
NORTHERN ANCHOVY	4.7	SHORTBELLY ROCKFISH	11.8	SABLEFISH	4.2	SPOTTED RATFISH	8.1
PLAINFIN MIDSHIPMAN	3.0	DOVER SOLE	8.1	SPLITNOSE ROCKFISH	4.1	PACIFIC SANDDAB	4.5
CHILIPEPPER	2.5	REX SOLE	6.3	SHORTSPINE THORNYHEAD	2.1	CHILIPEPPER	4.4
HALFBANDED ROCKFISH	2.3	SABLEFISH	5.5	LONGSPINE THORNYHEAD	1.4	SPINY DOGFISH	4.2
WHITE CROAKER	1.2	BIGFIN EELPOUT	0.9	BROWN CAT SHARK	1.4	REX SOLE	4.2
ENGLISH SOLE	1.0	SPINY DOGFISH	0.6	FILETAIL CAT SHARK	1.3	PACIFIC SARDINE	3.7
CHUB MACKEREL	1.0	SPOTTED RATFISH	0.5	BLACKGILL ROCKFISH	1.2	SABLEFISH	3.2
PETRALE SOLE	0.6	SLENDER SOLE	0.5	BLACK EELPOUT	1.0	SHORTBELLY ROCKFISH	3.1
PINK SEAPERCH	0.5	LONGNOSE SKATE	0.3	BIGFIN EELPOUT	1.0	AURORA ROCKFISH	1.8
CHINOOK SALMON	0.5	BOCACCIO	0.2	SPOTTED RATFISH	0.9	NORTHERN ANCHOVY	1.6
PACIFIC HAKE	0.5	PACIFIC ELECTRIC RAY	0.2	LONGNOSE SKATE	0.5	PLAINFIN MIDSHIPMAN	1.0
NUMBER OF HAULS	16	NUMBER OF HAULS	12	NUMBER OF HAULS	18	NUMBER OF HAULS	46

MONTEREY AREA 55 - 183 m		MONTEREY AREA 184 - 366 m		MONTEREY AREA 367 - 500 m		MONTEREY AREA 55 - 500 m	
SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE
PACIFIC HAKE	158.3	PACIFIC HAKE	64.2	DOVER SOLE	44.7	PACIFIC HAKE	115.1
PACIFIC SANDDAB	12.6	SPLITNOSE ROCKFISH	47.0	REX SOLE	10.0	DOVER SOLE	12.0
JACK MACKEREL	12.0	STRIPETAIL ROCKFISH	31.6	PACIFIC HAKE	7.0	STRIPETAIL ROCKFISH	10.8
SHORTBELLY ROCKFISH	11.9	DOVER SOLE	16.9	SABLEFISH	6.0	SPLITNOSE ROCKFISH	9.4
CHILIPEPPER	10.7	CHILIPEPPER	11.3	AURORA ROCKFISH	3.9	CHILIPEPPER	9.0
STRIPETAIL ROCKFISH	7.5	SHARPCHIN ROCKFISH	7.8	SPLITNOSE ROCKFISH	3.8	SHORTBELLY ROCKFISH	8.3
ENGLISH SOLE	5.1	REX SOLE	5.8	SHORTSPINE THORNYHEAD	2.6	PACIFIC SANDDAB	8.2
WHITE CROAKER	5.1	SABLEFISH	5.6	BIGFIN EELPOUT	1.9	JACK MACKEREL	7.7
SPINY DOGFISH	3.6	SPINY DOGFISH	5.1	BLACKGILL ROCKFISH	1.1	REX SOLE	4.0
PLAINFIN MIDSHIPMAN	2.3	SHORTBELLY ROCKFISH	3.3	BROWN CAT SHARK	1.0	ENGLISH SOLE	3.7
DOVER SOLE	2.0	DARKBLOTCHED ROCKFISH	2.6	LONGSPINE THORNYHEAD	0.8	SPINY DOGFISH	3.3
REX SOLE	1.9	LINGCOD	2.4	STRIPETAIL ROCKFISH	0.7	WHITE CROAKER	3.3
CHUB MACKEREL	1.3	ENGLISH SOLE	2.2	SPOTTED RATFISH	0.6	SABLEFISH	2.6
CANARY ROCKFISH	1.2	BANK ROCKFISH	2.0	LONGNOSE SKATE	0.5	PLAINFIN MIDSHIPMAN	1.5
GREENSTRIPED ROCKFISH	1.2	BOCACCIO	1.7	PACIFIC SLEEPER SHARK	0.4	SHARPCHIN ROCKFISH	1.5
NUMBER OF HAULS	76	NUMBER OF HAULS	22	NUMBER OF HAULS	20	NUMBER OF HAULS	118

EUREKA AREA 55 - 183 m		EUREKA AREA 184 - 366 m		EUREKA AREA 367 - 500 m		EUREKA AREA 55 - 500 m	
SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE
PACIFIC HAKE	31.0	PACIFIC HAKE	51.3	SABLEFISH	20.2	PACIFIC HAKE	32.7
PACIFIC HERRING	10.3	DOVER SOLE	12.0	DOVER SOLE	20.2	DOVER SOLE	7.2
CHUB MACKEREL	7.5	SABLEFISH	11.2	PACIFIC HAKE	14.8	SABLEFISH	7.1
PACIFIC SANDDAB	6.9	STRIPETAIL ROCKFISH	8.7	REX SOLE	8.9	PACIFIC HERRING	5.8
SPINY DOGFISH	6.8	SPLITNOSE ROCKFISH	5.2	SHORTSPINE THORNYHEAD	6.2	CHUB MACKEREL	5.2
JACK MACKEREL	2.3	CHUB MACKEREL	4.2	BLACK EELPOUT	3.4	SPINY DOGFISH	4.0
CHINOOK SALMON	2.3	REX SOLE	4.0	BROWN CAT SHARK	2.7	PACIFIC SANDDAB	3.9
PACIFIC HALIBUT	1.8	ARROWTOOTH FLOUNDER	2.9	AURORA ROCKFISH	2.4	REX SOLE	3.1
STRIPETAIL ROCKFISH	1.5	PACIFIC OCEAN PERCH	2.5	BIGFIN EELPOUT	1.3	STRIPETAIL ROCKFISH	2.9
REX SOLE	0.7	PACIFIC HALIBUT	2.3	ARROWTOOTH FLOUNDER	1.2	SHORTSPINE THORNYHEAD	1.7
SABLEFISH	0.7	SHORTSPINE THORNYHEAD	1.9	SPINY DOGFISH	0.9	PACIFIC HALIBUT	1.6
BIG SKATE	0.7	DARKBLOTCHED ROCKFISH	1.7	SPLITNOSE ROCKFISH	0.8	CHINOOK SALMON	1.5
DOVER SOLE	0.6	SHARPCHIN ROCKFISH	1.0	LONGNOSE SKATE	0.6	SPLITNOSE ROCKFISH	1.4
PETRALE SOLE	0.6	CHINOOK SALMON	0.9	SPOTTED RATFISH	0.4	JACK MACKEREL	1.3
ENGLISH SOLE	0.6	BIGFIN EELPOUT	0.7	ROUGHEYE ROCKFISH	0.2	ARROWTOOTH FLOUNDER	1.1
NUMBER OF HAULS	37	NUMBER OF HAULS	16	NUMBER OF HAULS	13	NUMBER OF HAULS	66

Table 4 (cont.)

COLUMBIA AREA 55 - 183 m		COLUMBIA AREA 184 - 366 m		COLUMBIA AREA 367 - 500 m		COLUMBIA AREA 55 - 500 m	
SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE
PACIFIC HAKE	181.2	SABLEFISH	21.1	SABLEFISH	12.7	PACIFIC HAKE	117.9
PACIFIC SANDDAB	16.7	PACIFIC HAKE	14.6	DOVER SOLE	11.5	PACIFIC SANDDAB	10.5
JACK MACKEREL	8.7	DOVER SOLE	9.2	SHORTSPINE THORNYHEAD	9.4	SABLEFISH	8.2
CHUB MACKEREL	7.3	DARKBLOTCHED ROCKFISH	8.3	PACIFIC HAKE	5.9	DOVER SOLE	5.9
PYGMY ROCKFISH	4.7	WIDOW ROCKFISH	6.7	REX SOLE	3.8	JACK MACKEREL	5.5
REX SOLE	4.1	ARROWTOOTH FLOUNDER	5.8	PACIFIC OCEAN PERCH	1.4	CHUB MACKEREL	4.6
DOVER SOLE	3.4	REX SOLE	5.7	ROUGHEYE ROCKFISH	1.3	REX SOLE	4.4
SABLEFISH	2.6	SHARPCHIN ROCKFISH	5.4	LONGNOSE SKATE	0.9	PYGMY ROCKFISH	2.9
ENGLISH SOLE	2.3	SPLITNOSE ROCKFISH	4.5	ARROWTOOTH FLOUNDER	0.8	SHORTSPINE THORNYHEAD	2.3
PACIFIC HALIBUT	1.9	SHORTSPINE THORNYHEAD	3.8	LONGSPINE THORNYHEAD	0.8	ARROWTOOTH FLOUNDER	2.1
AMERICAN SHAD	1.6	STRIPETAIL ROCKFISH	2.3	AURORA ROCKFISH	0.8	DARKBLOTCHED ROCKFISH	2.1
GREENSTRIPED ROCKFISH	1.5	PACIFIC HALIBUT	1.8	SHORTRAKER ROCKFISH	0.8	PACIFIC HALIBUT	1.6
ARROWTOOTH FLOUNDER	1.1	GREENSTRIPED ROCKFISH	1.3	BROWN CAT SHARK	0.7	ENGLISH SOLE	1.6
CANARY ROCKFISH	1.1	PACIFIC OCEAN PERCH	0.8	BIGFIN EELPOUT	0.4	WIDOW ROCKFISH	1.4
PACIFIC HERRING	0.9	ENGLISH SOLE	0.6	BLACK EELPOUT	0.3	GREENSTRIPED ROCKFISH	1.2
NUMBER OF HAULS	115	NUMBER OF HAULS	39	NUMBER OF HAULS	29	NUMBER OF HAULS	183

U.S. VANCOUVER AREA 55 - 183 m		U.S. VANCOUVER AREA 184 - 366 m		U.S. VANCOUVER AREA 367 - 500 m		U.S. VANCOUVER AREA 55 - 500 m	
SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE
PACIFIC HAKE	196.4	DOVER SOLE	12.5	DOVER SOLE	9.3	PACIFIC HAKE	115.7
SPINY DOGFISH	15.3	ARROWTOOTH FLOUNDER	7.7	SHORTSPINE THORNYHEAD	4.6	SPINY DOGFISH	9.6
PACIFIC HALIBUT	6.8	PACIFIC HAKE	7.7	REX SOLE	3.4	DOVER SOLE	6.3
PACIFIC SANDDAB	6.3	PACIFIC OCEAN PERCH	5.5	PACIFIC HAKE	2.7	ARROWTOOTH FLOUNDER	4.6
PACIFIC HERRING	3.9	SHORTSPINE THORNYHEAD	3.7	PACIFIC OCEAN PERCH	2.2	PACIFIC HALIBUT	4.3
ARROWTOOTH FLOUNDER	3.6	REX SOLE	3.5	ROUGHEYE ROCKFISH	1.5	PACIFIC SANDDAB	3.6
YELLOWTAIL ROCKFISH	3.5	SPINY DOGFISH	2.6	SABLEFISH	1.0	REX SOLE	2.4
ENGLISH SOLE	3.4	SABLEFISH	1.8	ARROWTOOTH FLOUNDER	0.7	PACIFIC HERRING	2.3
DOVER SOLE	2.3	GREENSTRIPED ROCKFISH	1.5	SHORTRAKER ROCKFISH	0.3	YELLOWTAIL ROCKFISH	2.2
SABLEFISH	1.9	DARKBLOTCHED ROCKFISH	1.5	BROWN CAT SHARK	0.2	PACIFIC OCEAN PERCH	2.0
REX SOLE	1.6	SPOTTED RATFISH	1.3	LONGNOSE SKATE	0.2	ENGLISH SOLE	2.0
GREENSTRIPED ROCKFISH	1.4	SHARPCHIN ROCKFISH	1.2	YELLOWTAIL ROCKFISH	0.2	SABLEFISH	1.7
AMERICAN SHAD	0.9	PACIFIC HALIBUT	1.1	AURORA ROCKFISH	0.2	SHORTSPINE THORNYHEAD	1.7
PACIFIC COD	0.8	LONGNOSE SKATE	0.9	BLACK EELPOUT	0.1	GREENSTRIPED ROCKFISH	1.3
LINGCOD	0.8	YELLOWTAIL ROCKFISH	0.7	BIGFIN EELPOUT	0.1	AMERICAN SHAD	0.6
NUMBER OF HAULS	23	NUMBER OF HAULS	13	NUMBER OF HAULS	4	NUMBER OF HAULS	40

CANADIAN VANCOUVER AREA 55 - 183 m		CANADIAN VANCOUVER AREA 184 - 366 m		CANADIAN VANCOUVER AREA 367 - 500 m		CANADIAN VANCOUVER AREA 55 - 500 m	
SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE	SPECIES	CPUE
ARROWTOOTH FLOUNDER	26.5	PACIFIC OCEAN PERCH	46.3	ROUGHEYE ROCKFISH	44.9	ARROWTOOTH FLOUNDER	27.8
PACIFIC HAKE	20.5	ARROWTOOTH FLOUNDER	43.5	ARROWTOOTH FLOUNDER	17.8	PACIFIC HAKE	16.8
SPINY DOGFISH	16.6	SHARPCHIN ROCKFISH	12.7	DOVER SOLE	13.2	SPINY DOGFISH	12.8
DOVER SOLE	8.7	REDSTRIPE ROCKFISH	9.9	PACIFIC OCEAN PERCH	11.3	DOVER SOLE	8.9
SABLEFISH	7.1	DOVER SOLE	6.8	PACIFIC HAKE	8.6	PACIFIC OCEAN PERCH	7.0
REX SOLE	5.3	PACIFIC HALIBUT	6.4	PACIFIC HALIBUT	5.7	SABLEFISH	6.7
PACIFIC SANDDAB	4.7	SABLEFISH	6.0	SHORTSPINE THORNYHEAD	5.2	REX SOLE	5.2
LINGCOD	4.1	REX SOLE	4.8	SABLEFISH	4.9	ROUGHEYE ROCKFISH	5.0
FLATHEAD SOLE	3.1	SPLITNOSE ROCKFISH	4.2	REX SOLE	4.4	PACIFIC SANDDAB	3.6
ENGLISH SOLE	2.6	DARKBLOTCHED ROCKFISH	3.9	LONGNOSE SKATE	1.2	LINGCOD	3.4
PACIFIC HALIBUT	2.1	YELLOWTAIL ROCKFISH	3.8	SHORTRAKER ROCKFISH	0.8	PACIFIC HALIBUT	3.0
PACIFIC COD	1.9	ROUGHEYE ROCKFISH	3.6	BIGFIN EELPOUT	0.7	FLATHEAD SOLE	2.4
PACIFIC HERRING	1.8	SILVERGRAY ROCKFISH	3.0	REDBANDED ROCKFISH	0.6	ENGLISH SOLE	2.1
GREENSTRIPED ROCKFISH	1.7	GREENSTRIPED ROCKFISH	2.0	BERING SKATE	0.4	SHARPCHIN ROCKFISH	1.9
LONGNOSE SKATE	1.5	PACIFIC COD	1.7	KING-OF-THE-SALMON	0.3	REDSTRIPE ROCKFISH	1.7
NUMBER OF HAULS	55	NUMBER OF HAULS	9	NUMBER OF HAULS	7	NUMBER OF HAULS	71

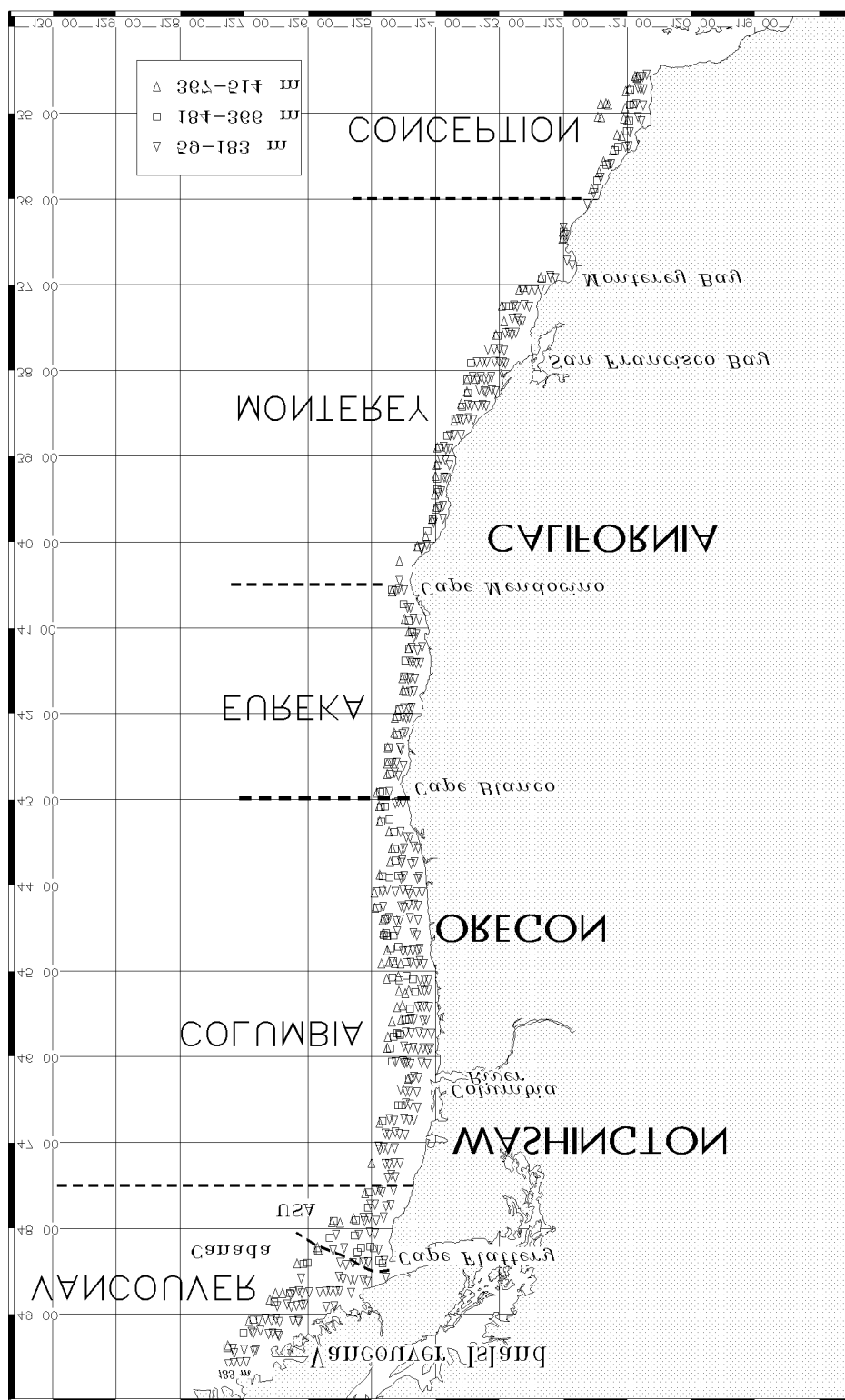


Figure 1.--Stations sampled successfully during the 1995 NMFS triennial bottom trawl survey.

Figure 2.-- D:\95TRI\RESULTS\TEMPERA.XLS

Figure 3.--D:\95TRI\RESULTS\LEN_PLOT.XLS